Ann Ist Super Sanità 2020 | Vol. 56, No. 1: 30-37
DOI: 10.4415/ANN_20_01_06

HIV prevalence among adults in Rome: results of the MeDi (Measuring health Disparities in HIV prevention) survey. Part 2

Maria Fenicia Vescio[1], Pietro Gallo[1], Francesca Farchi[1], Luca Avellis[1], Teresa Spadea[2], Massimo Giuliani[3], Giovanna Pedone[1], Ilario Mammone[4], Hyppolite Tchidjou Kuekou[5], Giovanni Rezza[1], Enrico Girardi[6], Patrizio Pezzotti[1] and the MeDi Study Group*

[1]Dipartimento di Malattie Infettive, Istituto Superiore di Sanità, Rome, Italy
[2]Unità di Epidemiologia, Azienda Sanitaria Locale Torino 3 (Asl TO3), Turin, Italy
[3]Dermatologia Allergologica Professionale e Ambientale, Istituto Dermatologico San Gallicano, Rome, Italy
[4]Società italiana di Psicologia e Psichiatria, Rome, Italy
[5]Immunoinfettivologia Pediatrica, Dipartimento Pediatrico Universitario-Ospedaliero, Ospedale Pediatrico Bambino Gesù, Rome, Italy
[6]Istituto Nazionale per le Malattie Infettive, Ospedale Lazzaro Spallanzani, Rome, Italy
**The composition of the MeDi Study Group is reported before the References*

Abstract

Background. In Italy, out of 60 millions of inhabitants, 3000 (2700-4000) new HIV infections are estimated each year. As combined antiretroviral therapy (ART) prolongs life for HIV sufferers, the prevalence of HIV-infection is likely to increase over time. Few studies have assessed factors associated with being HIV positive in people accessing public outpatient clinics and, in particular, the influence of socio-economic circumstances on HIV prevalence. This study aims to evaluate the association between subjects' serostatus and socio-economic determinants measured at the individual and neighbourhood levels.

Methods. Data from a large anonymous survey performed in 2012-2014 on more than 10 000 individuals 18-59 years old who underwent 21 public ambulatories in Rome were analysed. Subjects' socio-demographic characteristics, sexual orientation, number of sexual partners, HIV risk behaviour and HIV testing uptake were collected by a self-administered questionnaire. Level of area deprivation was measured at the postal code level by the index of social disadvantage (ISD). Multilevel Poisson regressions were carried out to take heterogeneity between clusters (post code and clinics) into account.

Results. Self-reported HIV-prevalence was 2.0% among subjects ever been tested (13.7% for the homosexual/lesbians 7.0% for the bisexual and 1.3% for the heterosexual). About 1% of subjects self-identified as low risk was HIV infected. This prevalence increased up to 2% in the age group 18-34 and up to 5% in the non-heterosexuals (i.e. self- identified homosexuals/lesbians and bisexuals). At the individual level, HIV-prevalence decreased linearly from lowest to highest levels of education. Living in a deprived neighbourhood was not associated with HIV-infection.

Conclusions. Our study confirms high HIV prevalences among homosexuals/lesbians. Some infections occur in subjects who do not report high risk behaviours for HIV transmission.

Key words

- HIV
- HIV testing
- SEP
- deprivation
- Italy
- urban

BACKGROUND

HIV prevalence has increased in Italy since 1995. In 2012, out of a population of 60 million, it is estimated that 123 000 (115 000-145 000) subjects live with HIV infection [1], 11-13% of whom non-diagnosed [2]. It is also estimated that 3000 (2700-4000) new cases occur every year [1]. 36.6% of them have a number of CD4 cells below 200 cell/ml [3]. This proportion increases to

Address for correspondence: Maria Fenicia Vescio, Unità di Epidemiologia, Biostatistica e Modelli Matematici, Dipartimento di Malattie Infettive, Istituto Superiore di Sanità, Viale Regina Elena 299, 00161 Rome, Italy. E-mail: vescio@iss.it.

52.7% in the population of 50 years of age or older and to 46.5% in the heterosexual men [3].

The demography of HIV infection has changed since the beginning of the epidemic and, while incidences among homosexuals and injective drug users remain high, new cases occur in heterosexual men and older subjects [3] in particular among the poor.

Studies carried out in western countries suggest that individual socio-economic-position (SEP) and area deprivation might be related to timing of diagnosis and risk of infection [4-9]. At the individual level low literacy, poverty, relationship instability caused by economic stress, unemployment and incarceration can encourage the uptake of risky behaviours. At the neighbourhood level, residential social displacement, segregation (e.g. attending lower quality schools, high crime rate), inequities in environmental resources and psychological influences (e.g. HIV-related stigma, minority stress) concentrate poverty and any attributes correlated with it including HIV infection. Geographical clustering of HIV infections among populations of low SEP may expose subjects to higher transmission rates than individual circumstances alone would indicate. Few studies, at least in Italy, have investigated the connection between socio-economic deprivation and risk of HIV infection. To fill this gap, we carried out a survey of the general adult population living in Rome, between January 2012 to November 2014 to determine the proportion of subjects tested for HIV and factors related to testing uptake. Rationale of the MeDi survey was that of providing baseline information on existing levels of positive health behaviours and HIV related risk factors. Specific aims of this article were: 1) to estimate the prevalence of HIV seropositivity in the population living in Rome who attended one of the outpatient clinics included in the study; and 2) to evaluate the association between HIV serostatus, subjects' socio-economic characteristics and the deprivation of their area of residence.

MATERIALS AND METHODS

Data sources

Data on 5292, 18-59 years old men and women living in Rome who reported HIV testing results and participated in the MeDi (Measuring health Disparities in HIV prevention) survey were used for this analysis.

MeDi survey

The MeDi study is a cross section survey (see "Prevalence and Attitudes to HIV testing among adults in Rome" where the survey methods are fully described [10]) which collected self-reported data on health perception, life satisfaction, access to health care and at risk sexual behaviour in a sample of more than 10 000 individuals aged 18-59 years attending public outpatient clinics in Rome between 2012-2014.

The MeDi questionnaire was developed by the authors building on previous research [11, 12]. Respondents were asked about their socio-demographic characteristics (gender, nationality, age, duration of stay in Rome, postal code of the area of residence, educational level, occupation, marital status, duration of stable relationships, health exemption tickets and pregnancy status), their sexual orientation, the number of sexual partners they had had in the last six months, over the past five years and lifetime and whether they had ever been tested for HIV. HIV risk behaviour was evaluated by asking subjects whether they had ever been in one or more situations at high risk for HIV transmission. Two lists of hypothetical situations were provided. The first one included: "I have used injective drugs", "I have had sex under the effect of alcohol or drugs", "I have had anal intercourse without a condom", "I have given or received money in exchange for sex"; the second one included: "I have had multiple sexual partners over the same period", "my partner has had multiple sexual partners over the same period", "I have not used a condom during the last intercourse with a casual partner", "I have not used a condom during sexual intercourse with a HIV positive partner". Participants were also asked whether they had ever suffered from chlamydia, gonorrhea, syphilis, herpes genitalis and genital warts.

Neighbourhood characteristics

The Index of social disadvantage (ISD) was developed by the "Ufficio Metropolitano di Statistica" and the "Ufficio di Statistica di Roma Capitale" to produce a statistical report on the Roman metropolitan area as the sum of the unweighted z-scores for the following census variables: unemployment, employment, youth concentration and schooling [13]. The ISD was re-aggregated from census section to postal codes polygons by areal interpolation in "Quantum" GIS(QGIS) [14].

Postal codes were also classified in tertiles of frequency according to the proportion of HIV+ subjects within each postal code.

Characteristics of outpatient clinics

Clinics were classified according to whether they were located within a hospital or not (district facilities) and to whether the amount of prescriptions provided by all clinics combined in the year 2009 was above or below the median as: small size clinics within district facilities (annual amount of prescriptions below 12 000 in 2009); medium size clinics within district facilities (amount of prescriptions of 12 000 or greater) and; hospital based outpatient clinics. Clinics were also classified according to the proportion of prescriptions exempted from the co-pay fee for low income in the year 2009 to the total number of prescriptions for the same year in tertiles of frequency (population weighted) of co-pay fee for low income as: clinics with a proportion of co-pay fee exemption for low income below 1.1%; between 1.1 and 1.4%; and of 1.4% or more.

Ethics and funding

The survey was approved by the Ethics Committee of Istituto Superiore di Sanità, Rome, Italy n. CE/12/338, 07/05/2012. Each subject was also asked to formally consent to participate in the study. The study was funded by the Ministry of Health as part of the HIV/AIDS projects.

Statistical analysis

Crude, age and gender specific, and age-standardized prevalences of self reported HIV serostatus were cal-

culated. As reference population, we used the 2012 Eurostat European population, stratified by age-group [15]. Fisher exact chi-square tests were computed to investigate the association between HIV serostatus and possible determinants/predictors variables such as socio-demographic characteristics, sexual behaviour, sexually transmitted infections (STI) in the past, and different levels of social disadvantage in the area where the participant was living (see below for description).

Poisson regression models were used to produce unbiased prevalence ratios estimate [16]. A test for linear trend was carried out, if necessary, across strata of ordinal categorical variables, including them as "continuous" variables in a Poisson model. Poisson regressions, with stepwise selection, were carried out to identify independent predictor variables from those with a p-value <0.20 at the univariate analysis.

Within and between clusters (post code and clinics) variances were investigated using a multilevel framework. Since the variance at the postal code level and clinics levels was not significant, a Poisson model with no random terms was carried out (i). To this model were added in the following order: individual (ii) and contextual level covariates (iii) as identified with the stepwise procedure, (iii) and the cross level interaction terms between deprivation and strata of age, sex, sexual orientation and SEP (iv). Only significant effects (from log-likelihood ratio test) were retained. A secondary analysis was carried out to estimate the prevalence of HIV infection in subjects who reported that they did never engage in HIV risk behaviours and had not had a STI in the past. Subjects reporting at least one risk behaviour and/or had had a STI in the past were defined as "high risk"; those not reporting a risk behaviour and / or a STI were considered "low risk". Statistical analyses were carried out in Stata 13 [17].

RESULTS

Figure 1 shows the population involved in this study. Socio-demographic characteristics of subjects by HIV serostatus, are reported in *Table 1*. Out of 6433 tested subjects, 5292 reported HIV results (5184 were HIV- and 108 HIV+) with a crude prevalence of 2.0% (95% CI: 1.7%; 2.5%). Median ages were 39 years (iqr. 33-46) for the HIV- and 35 years (iqr: 31-45) for the HIV+. Age and sex specific prevalences were 3.1% (95%CI: 2.3%; 4.1%) for males and 1.6% (95% CI: 1.2%; 2.1%) for females, 3.2% (95% CI: 2.4%; 4.1%) for the age group 18-34, 1.4% (95% CI: 0.9%; 1.8%) for the age group 35-49 and 2.0% (95% CI: 1.0%; 3.3%) for the age group 50-59. Age standardized prevalence was 2.0% (95% CI: 1.5%; 2.8%).

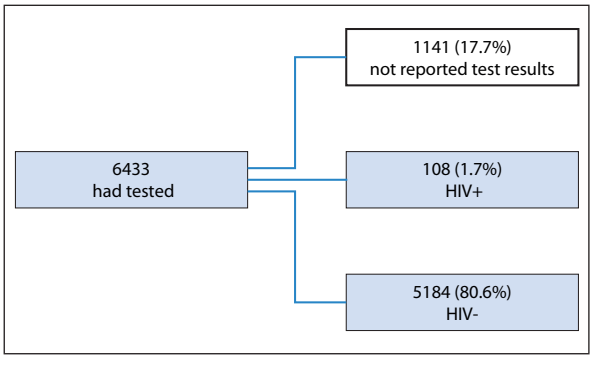

Figure 1
Flow chart of the study population: men and women participating at the MeDi survey between January 2012 and November 2014 who underwent HIV testing and reported test results.

Prevalences of HIV infection were 13.7% for the homosexuals/lesbians, 7.0% for the bisexual, and 1.3% for the heterosexuals (18 HIV+ subjects did not report any information about their sexual orientation). Four point five percent of the low educated and about 1.7% of subjects with a medium or higher educational attainment were HIV+. Five point six percent of subjects who had had 2 or more partners in the past six months, 5.4% of those who had had a STI in the past, 6.9% of those who reported having had more than one high risk behaviours for HIV and 3.5% of those living in areas with a high prevalence of HIV were HIV+.

Results from the multivariable analysis of age, educational attainment, sexual orientation, stable partnership, risky sexual behaviours, STI and HIV prevalence at area level (all had p values <0.2 at the univariate analysis) resembled those obtained from the univariate analysis (see *Table 1*). Prevalence ratios (PR) were 0.62 (95%: 0.40; 0.95) and 0.82 (95%: 0.45; 1.51) respectively for the age groups 35-49 and 50-59 compared to the age group 18-34. HIV prevalence showed a graded association across the educational range decreasing linearly from lowest to highest levels (medium: PR: 0.42; 95% CI: 0.26; 0.68; high: PR: 0.36; 95% CI: 0.21; 0.60; p linear trend: <0.001). Compared to heterosexuals, homosexuals/lesbians, bisexuals and other sexual orientations were respectively 5.38 (95% CI: 3.02; 9.59), 1.99 (95% CI: 0.92; 4.34) and 2.62 (95% CI: 1.26-5.47) times more likely to be HIV+. Those who had had a STI in the past had a PR of 2.00 (95% CI: 1.23; 3.26) compared to those who had never had it. Prevalences increased linearly with the increase in the number of high risk situations (one high risk situation: PR 1.99: 95% CI: 1.21; 3.25; PR: more than one risk situation: 2.44: 95% CI: 1.38; 4.32; p linear trend: <0.040). Subjects living in neighbourhoods with a medium/ high HIV prevalence were more likely to be HIV+ than those living in low prevalence neighbourhoods (medium prevalence neighbourhoods PR: 3.07; 95% CI: 1.72; 5.48; high prevalence neighbourhoods PR: 2.98; 95% CI: 1.65; 5.41).

Secondary analyses restricted to those who did not engage in any risk behaviour yielded prevalences of 1.6% (95% CI: 0.8%; 2.7%) for men and of 1.1% (95% CI: 0.7%; 1.6%) for women. Prevalences were 2.1% (1.3%; 3.1%), 0.1% (0.0%; 1.3%) and 1.1% (0.0%; 2.6%) for the age groups 18-34, 35-49 and 50-59. The homosexuals/lesbians, the bisexuals and the other groups combined had a HIV prevalence of 4.9% (95% CI: 2.1%; 9.4%) while the heterosexuals had a prevalence of 0.8% (95% CI: 0.5%; 0.1%). Prevalences were 0.1 (95% CI: 0.0; 1.4) and 2.2 (95% CI: 1.1;3.9) in the high and low educated.

DISCUSSION

Using data from a large survey performed in 2012-2014 on more than 10 000 individuals 18-59 years old

Table 1
Prevalence ratio (PR) of HIV serostatus by socioeconomic and demographic characteristics of 5292 HIV tested men and women (aged 18-59 years) participating in the MeDi survey from January 2012 to November 2014. Results from univariate and multivariable Poisson models of HIV serostatus

	HIV-uninfected		HIV-infected						
	N.	(%)	N.	(%)	p	PR	95% CI		p
Individual level variables									
Gender					0.002	NI			
Female	3688	98.40	60	1.60					
Male	1448	96.86	47	3.14					
Not reported	48	97.96	1	2.04					
Years of age					0.001				
18-34	1615	96.82	53	3.18		1			
35-49	2857	98.62	40	1.38		0.62	0.40	0.95	0.028
50-64	694	98.02	14	1.98		0.82	0.45	1.51	0.530
Not reported	16	100.00	0	0.00		0.00	0.00		
Marital status					0.002	NI			
Single	1453	96.87	47	3.13					
Married/cohabiting	3108	98.57	45	1.43					
Separated/widowed	572	97.61	14	2.39					
Not reported	49	98.00	1	2.04					
Educational attainment					<0.001				
Low	587	95.45	28	4.55		1			
Medium	2588	98.29	45	1.71		0.42	0.26	0.68	<0.001
High	1977	98.31	34	1.69		0.36	0.21	0.60	<0.001
Not reported	13	100.00	0	0.00		0.00	0.00		
Occupation					0.011	NI			
Unemployed	767	97.34	21	2.66					
Employed	2469	98.52	37	1.48					
Self-employed	743	96.62	26	3.38					
Other	1181	98.09	23	1.91					
Not reported	22	100.00	0	0.00					
Sexual orientation					<0.001				
Heterosexual	3949	98.70	52	1.3		1			
Homosexuals/lesbians	120	86.33	19	13.67		5.38	3.02	9.59	<0.001
Bisexual	120	93.02	9	6.98		1.99	0.92	4.34	0.082
Other	147	94.23	9	5.77		2.62	1.26	5.47	0.010
Not reported	846	97.92	18	2.08		2.00	1.15	3.48	0.014
Stable partner					<0.001				
No	881	95.66	40	4.34		1			
Yes	4233	98.51	64	1.49		0.65	0.42	0.99	0.048
Not reported	68	95.77	3	4.23		0.97	0.29	3.21	0.963
Number of partners in the last 6 months					<0.001	NI			
0-1	4514	98.34	76	1.66					
2-3	282	95.59	13	4.41					
4-5	41	95.35	2	4.65					
5+	67	90.54	7	9.46					
Not reported	278	96.86	9	3.14					

Continues

Table 1
Continued

	HIV-uninfected		HIV-infected						
	N.	(%)	N.	(%)	p	PR	95% CI		p
Number of partners in the last 5 years					<0.001	NI			
0-1	3909	98.44	62	1.56					
2-3	612	97.61	15	2.39					
4-5	162	98.18	3	1.82					
6-9	97	97.98	2	2.02					
10+	157	90.23	17	9.77					
Not reported	245	96.84	8	3.16					
Number of partners lifetime					0.003	NI			
0-1	3562	97.43	94	2.57					
2-3	631	99.21	5	0.79					
4-5	328	99.70	1	0.30					
6-10	415	99.28	3	0.72					
11-19	100	99.01	1	0.99					
20+	74	98.67	1	1.33					
Not reported	72	97.3	2	2.70					
High risk sexual behaviours					<0.001				
None	3623	98.80	44	1.20		1			
One	825	96.27	32	3.73		1.99	1.21	3.25	0.006
More than one	336	93.07	25	6.93		2.44	1.38	4.32	0.002
Not reported	398	98.51	6	1.49		1.06	0.44	2.51	0.902
History of STI					<0.001				
No	4778	98.27	84	1.73		1			
Yes	404	94.61	23	5.39		2.00	1.23	3.26	0.005
Contextual level variables									
Index of social deprivation - area level[a]					0.704	NI			
Medium (-5.8./-4.5)	2399	98.12	46	1.88					
Low (< -5.8)	613	97.61	15	2.39					
High (>4.5)	2170	97.92	46	2.08					
Type of clinic					0.059	NI			
Low prescription volume (<12000)	2008	98.19	37	1.81					
High prescription volume (≥12000)	2310	97.51	59	2.49					
Hospital outpatient clinics	864	98.74	11	1.26					
Health care low income card-areaa level					0.444	NI			
Low (<1.1%)	1783	98.07	35	1.93					
Median (1.1%-1.4%)	1941	98.18	36	1.82					
High (≥1.4)	1458	97.59	36	2.41					
Prevalence of HIV-area level[a]					<0.001				
Low (<1.3%)	2023	99.22	16	0.78		1			
Median (1.3%-2.6%)	1959	97.66	47	2.34		3.07	1.72	5.48	<0.001
High (>2.6%)	1200	96.46	44	3.54		2.98	1.65	5.41	<0.001

NI: not included in the final model; [a] in tertiles; STI = sexually transmitted infections.

who underwent a visit in a public health care facility we found a prevalence of people reporting to be HIV-infected of 2.0% (95% CI: 1.5%; 2.8%) among those who declared to have ever been tested. This result is in line with a study carried out in 2012 which found that the overall estimated prevalence of HIV among subjects with known serostatus and linked to care was 2.2% in the Lazio region [18]. We found that the prevalences of HIV was 8.4 for homosexuals/lesbians and bisexuals (13.7% for the homosexuals/lesbians, 7.0% for the bisexual) and 1.3% for the heterosexual. In the same way, the 2010 EMIS study (European MSM Internet Survey) found that the self reported prevalence for men who have sex with another men (MSM) in Italy was 9.7% [19, 20]. A large-scale bio-behavioural survey implemented across 13 European cities, the Sialon II study, also found, in Verona (Italy), a measured prevalence of 9.6 among MSM between 2010-2014 [21], while in other European cities, estimates ranged between 2.4% in Stockholm to 18.0% in Bucharest [21, 22].

People with one or more risky sexual behaviour or who had had a STI in the past were especially at risk, but also, about 1% of men and women self identified as low risk (who did not engage in HIV risk behaviour and who had not had a STI in the past) was HIV infected. This prevalence increased up to 2% in the age group 18-34 and in the low educated and was of 5% in homosexuals/lesbians and bisexuals. Similarly, a qualitative study found that more than half of HIV positive MSM were surprised by their diagnosis and believed themselves to have only practiced safe sex [23]. Our results are also consistent with findings from other studies which observe that about one third of HIV infections among MSM occur within main partnerships [24].

We found that there is an inverse association between education and HIV prevalence, being subjects with lower levels of education at higher risk of HIV infection than their highly educated counterparts in line with the observed socio-economic patterning of sexual risk behaviours (e.g. having more sexual partners or a partner with several partners). This result may be also influenced by a less efficient use of the health services (e.g. an increased use of emergency department and hospitals, and a lower use of prevention services) among the low educated [25-28] which, in the long run, increases HIV progression and risk of death [29] .

At the area level, we observed that subjects living in neighbourhoods with a medium/ high HIV prevalence were more likely to be HIV+ than those living in low prevalence neighbourhoods. Some studies argued that, the greater exposure to a high HIV prevalence pool of individuals may foster HIV epidemic in some strata of the population (e.g. ethnic groups) [30]. We found no evidence that living in a deprived neighbourhood increases HIV risk overall and for any population strata considered (age groups, sexes, SEP, sexual orientation). A study carried out among individuals aged 13 years and older residing in 37 US states found that HIV diagnosis rates increased as community deprivation decreased [7], but the effect differed for various strata of the population and was negligible for white males. Additionally, a study carried out in US cities also found that from 1990 to 2000, HIV incidence was highest amongst higher-income, more educated individuals but transitioned to a poverty- and low-education-dependent risk after 2000 [6].

Limitations and strengths

Some limitations can be highlighted: 1) the MeDi data are self-reported and may be subject to biases such as social desirability or recall bias and underreporting of risk behaviours associated with HIV; 2) HIV serostatus was also self reported; 3) the study was conducted in local and hospital based out-patient clinics and we cannot exclude that the prevalence of HIV could have been different for those not accessing the outpatient clinics in the study period; 4) the survey was based on non-institutionalized populations and excluded all subjects living in nursing homes, prison or long-term-care facilities at the time in which the survey took place. Incarcerated persons may have higher risks for HIV. However, some subject self reported to have been tested in correctional facilities before the survey took place; 5) the sampling frame was the Roman metropolitan area, rural/suburban areas outside of the metropolitan belt were not represented. Because of these limitations, the results might be either underestimated or overestimated when generalized to other populations; 6) few people have social activities only in an area defined by the postal code of residence and their life could be affected also by socioeconomic determinants of other places (e.g. work places) which were not taken into account in our work.

A strength of the present study is the utilization of data from a large survey of the general population with a response rate as high as 83%.

CONCLUSIONS AND IMPLICATIONS

Our study confirms high HIV prevalences among homosexuals/lesbians. Prevention efforts are not adequately reaching them in Rome and there is a real possibility that the HIV epidemic may further expand since some infections occur, presumably within main partnership, in subjects who do not report high risk behaviours for HIV transmission. It is believed that tackling poverty can lead to a reduction in HIV transmission. However, we did not find support for this at the postcode level, but this does not exclude that such a relationship exists for other indicators and other geographical levels [31].

Conflict of interest statement

There are no potential conflicts of interest or any financial or personal relationships with other people or organizations that could inappropriately bias conduct and findings of this study.

MeDi (Measuring health Disparities in HIV prevention) Study Group

Dipartimento di Malattie Infettive, Istituto Superiore di Sanità, Rome, Italy, coordination unit:

MF Vescio, L Avellis, P Gallo, G Pedone, F Farchi.

Società Italiana di Psicologia e Psichiatria (SiPsi), Rome, Italy, data collection unit:

I Mammone, E Arganese, F Caltagirone, V Di Rago, MC Ferrari, G Gabrielli, C Iacobucci, A Messner, D

Milos, B Pace, D Raspanti, S Roccabella, N Tani, C Zaky, M Racco.

Received on 8 August 2019.
Accepted on 29 October 2019.

REFERENCES

1. Camoni L, Regine V, Stanecki K, Salfa MC, Raimondo M, Suligoi B. Estimates of the number of people living with HIV in Italy. Biomed Res Int. 2014;2014:209619. doi: 10.1155/2014/209619
2. Mammone A, Pezzotti P, Regine V, Camoni L, Puro V, Ippolito G, et al. How many people are living with undiagnosed HIV infection? An estimate for Italy, based on surveillance data. AIDS. 2016;30(7):1131-6. doi:10.1097/QAD.0000000000001034
3. Raimondo M, Boros S, Regine V, Pugliese L, Santaquilani M, Ferri M, et al. Aggiornamento delle nuove diagnosi di infezione da HIV e dei casi di AIDS in Italia al 31 Dicembre 2015. Not Ist Super Sanità. 2015;28(9, Suppl.1):1-47.
4. Lodi S, Dray-Spira R, Touloumi G, Braun D, Teira R, d'Arminio MA, et al. Delayed HIV diagnosis and initiation of antiretroviral therapy: inequalities by educational level, COHERE in EuroCoord. AIDS. 2014;28(15):2297-306. doi: 10.1097/QAD.0000000000000410
5. Taborelli M, Virdone S, Camoni L, Regine V, Zucchetto A, Frova L, et al. The persistent problem of late HIV diagnosis in people with AIDS: a population-based study in Italy, 1999-2013. Public Health. 2017;142:39-45. doi: 10.1016/j.puhe.2016.10.009
6. Buot ML, Docena JP, Ratemo BK, Bittner MJ, Burlew JT, Nuritdinov AR, et al. Beyond race and place: distal sociological determinants of HIV disparities. PLoS One. 2014;9(4):e91711. doi: 10.1371/journal.pone.0091711
7. An Q, Prejean J, McDavid HK, Fang X. Association between community socioeconomic position and HIV diagnosis rate among adults and adolescents in the United States, 2005 to 2009. Am J Public Health. 2013;103(1):120-6.
8. Brodish PH. An association between neighbourhood wealth inequality and HIV prevalence in sub-Saharan Africa. J Biosoc Sci. 2015;47(3):311-28. doi: 10.1017/S0021932013000709
9. Gueler A, Schoeni-Affolter F, Moser A, Bertisch B, Bucher HC, Calmy A, et al. Neighbourhood socio-economic position, late presentation and outcomes in people living with HIV in Switzerland. AIDS. 2015;29(2):231-8. doi: 10.1097/QAD.0000000000000524
10. Vescio MF, Gallo P, Farchi F, Avellis L, Spadea T, Giuliani M, et al. Prevalence and attitudes to HIV testing among adults visiting public outpatient clinics in Rome: results of the MeDi (Measuring health Disparities in HIV prevention) survey. Part 1. Ann Ist Super Sanità. 2020;56(1):19-29.
11. University of Cambridge. The GP patient Survey questionnaire. Available from: http://www phpc cam ac uk/gpaq/home/downloads/.
12. BRFSS Questionnaire/Final/11.18.2009. Available from: www.cohealthdata.dphe.state.co.us/chd/Resources/brfss/2010%20BRFSS_Final_VA.pdf.
13. Direzione sistemi informativi di pianificazione e controllo finanziario. U.O. Statistica. Comune di Roma. Gli indici di disagio sociale ed edilizio a Roma. Analisi per municipio e zona urbanistica. Censimento 2011. Available from: www.comune.roma.it/PCR/resources/cms/documents/Gli_indici_di_disagio_sociale_ed_edilizio_a_Roma_X.pdf.
14. Quantum GIS Geographic Information System. Open Source Geospatial Foundation Project. [computer program]. Version 2.18. 2017.
15. EUROSTAT. Available from: http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-data.
16. CoutinhoI MS, ScazufcaII M, Menezes PR. Methods for estimating prevalence ratios in cross-sectional studies. Rev Saúde Pública. 2008;46(6):992-8.
17. StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP. [computer program]. 2013.
18. Camoni L, Raimondo M, Dorrucci M, Regine V, Salfa MC, Suligoi B. Estimating minimum adult HIV prevalence: a cross-sectional study to assess the characteristics of people living with HIV in Italy. AIDS Res Hum Retroviruses. 2015;31(3):282-7. doi: 10.1089/aid.2014.0154
19. Weatherburn P, Schmidt AJ, Hickson FCI, Reid DS, Berg RC, Hospers HJ, et al. The European Men-who-have-sex-with-men internet survey (EMIS): design and methods. Sex Res Soc Pol. 2013. doi: 10.1007/s13178-013-0119-4
20. EMIS. EMIS 2010. The European Men-Who-Have-Sex-With-Men Internet Survey. Findings from 38 countries. Stockholm: ECDC; 2013.
21. The Sialon II Project. Report on a Bio-behavioural Survey among MSM in 13 European cities. Roma: Cierre & Grafica; 2016.
22. Robert Koch Institute. D1: Review of HIV and sexually transmitted infections among men who have sex with men (MSM) in Europe. Work Package 1, ESTICOM Project (European Surveys and Training to Improve MSM Community Health). Berlin, Germany; 2017.
23. Dowson L, Kober C, Perry N, Fisher M, Richardson D. Why some MSM present late for HIV testing: a qualitative analysis. AIDS Care. 2012;24(2):204-9. doi: 10.1080/09540121.2011.597711
24. Goodreau SM, Carnegie NB, Vittinghoff E, Lama JR, Sanchez J, Grinsztejn B, et al. What drives the US and Peruvian HIV epidemics in men who have sex with men (MSM)? PLoS One. 2012;7(11):e50522. doi: 10.1371/journal.pone.0050522
25. Jansen T, Rademakers J, Waverijn G, Verheij R, Osborne R, Heijmans M. The role of health literacy in explaining the association between educational attainment and the use of out-of-hours primary care services in chronically ill people: a survey study. BMC Health Serv Res. 2018;18(1):394. doi: 10.1186/s12913-018-3197-4
26. Simonds SK. Health education as social policy. Health Ed Monogr. 1974;2(1):1-10. doi: 10.1177/10901981740020S102
27. Kickbusch I, Pelikan JM, Apfel F, Tsouros AD. Health literacy: the solid facts. Copenhagen: World Health Organization, Regional Office for Europe; 2013.
28. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Viera A, Crotty K, et al. Health literacy interventions and outcomes: an updated systematic review. Evid Rep Technol Assess (Full Rep). 2011;199:1-941.
29. Suligoi B, Zucchetto A, Grande E, Camoni L, Dal ML, Frova L, et al. Risk factors for early mortality after AIDS in the cART era: A population-based cohort study in Italy.

BMC Infect Dis. 2015;15:229. doi: 10.1186/s12879-015-0960-6

30. Ransome Y, Kawachi I, Braunstein S, Nash D. Structural inequalities drive late HIV diagnosis. The role of black racial concentration, income inequality, socioeconomic deprivation, and HIV testing. Health Place. 2016;42:148-58. doi: 10.1016/j.healthplace.2016.09.004

31. Krieger N, Waterman PD, Chen JT, Soobader MJ, Subramanian SV. Monitoring socioeconomic inequalities in sexually transmitted infections, tuberculosis, and violence: geocoding and choice of area-based socioeconomic measures – the public health disparities geocoding project (US). Public Health Rep. 2003;118(3):240-60. doi: 10.1093/phr/118.3.240